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ABSTRACT

Earlier versions of the four papers presented in this collection formed a symposium, "Children's Interactions with Television," at the 1982 International Congress of Applied Psychology in Edinburgh. In the first paper, "Children's Comprehension of Television Programs," Peter Rendell and Mary Nixon describe a study which examined children's recognition and reconstruction of the temporal order of events in a television program, as well as the effects of the frequency of scene cuts on program comprehension. "Presentation Medium and Story Comprehension in Young Children," by Sally Kent, reports a study which compared young children's memory and comprehension of a story presented through a picture book and a television cartoon, and investigated the effects of age, story content, and serial position on memory per se and the interaction among these variables and the medium. In "Young Children's Understanding of Emotional States as Depicted by Television Cartoon Characters," Ann Knowles and Mary Nixon describe a study in which 5- to 9-year-old children's awareness of cartoon characters' emotional states was related to their age, social perspective-taking ability, verbal ability, and remembering. In the final paper, "Children's Interactions with Television: New Research Perspectives and an Eye on Future Developments," Barrie Gunter places the research reported in the preliminary papers into a broader context, and discusses the role of the experimental techniques employed. Tables and graphs are included, and references are listed for each paper. (LMM)

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TELEVISION AND CHILDREN: COMPREHENSION OF PROGRAMS

Edited by

Sally Kent

in collaboration with

Mary Nixon and Ann Knowles

Monash University Faculty of Education: Clayton, Victoria, 1983.

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The papers presented in this monograph form part of a research project, TV and Children, located in the Faculty of Education, Monash University, and funded by HSV-7, Melbourne. We acknowledge with thanks the support of HSV-7 and the Faculty of Education in the production of this monograph.

Earlier versions of the four papers formed a symposium, Children's Interactions with Television, presented at the 20th International Congress of Applied Psychology, held in Edinburgh, July 25-31, 1982.

Both Monash University and the HSV-7 grant contributed to travel costs for the first three speakers. We thank the two institutions for permitting us to present this work at the Congress.

The Independent Broadcasting Authority, London, assisted Dr Barrie Gunter to attend as Discussant at the symposium. We thank both the Authority and Dr Gunter for their contributions.

Mary Nixon
Project Director

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January, 1983

Children's Comprehension of Television Programs

Peter Rendell and Mary Nixon

Monash University

This study examined two aspects of comprehension: recognition and reconstruction of temporal order of events in a television program. The effects on program comprehension of frequency of scene cuts were also investigated. Children aged 6-11 years and young adults viewed a 10-12 minute segment from a comedy or drama program in small groups. They were then shown pairs of still photographs projected on to a screen and had to record which photograph they had seen (recognition) or which photograph came first (reconstruction) in the segment they had just viewed. Scores for both recognition and reconstruction of temporal order were significantly related to age, although all subjects performed well on the recognition task. Frequency of scene cuts did not affect scores across the age groups, but an interaction between sex of subjects and experimental condition (Few/Many Cuts) appeared. Children judged order more accurately when there was a large rather than a small temporal separation between the photographs, and when a photograph had appeared towards the end of the segment. Reconstruction of temporal order using pairs of photographs overcomes the difficulty that young children experience in free recall tasks (e.g., limited expository skills), yet it is suitable for a wide range of ages and enables a number of television features to be explored. Development of memory strategies is highly related to age and correlates of this relationship can be studied using reconstruction of temporal order tasks.

Television viewing is a substantial and regular activity in the daily lives of most children in the industrialised world. Social commentators, teachers and parents have expressed much concern about the social and behavioural impact of this constant viewing, yet relatively little research attention has been given to specific filmic techniques and their relationship to either the course of viewing or the aftermath of viewing. An exception is the development of Sesame Street, in which techniques which had been shown to capture and hold attention were deliberately used and systematically evaluated (e.g., Fowles & Voyat, 1974; Lesser, 1972; Horner & Fowles, Note 1).

Studies of attention to television have concentrated on visual attention; they show that it is highly variable during the course of a program (Anderson & Levin, 1976; Levin & Anderson, 1976; Murray &

Kippax, Note 2). Not much is known about children's attention to the auditory mode of television, but some evidence suggests that they monitor the sound when they are not looking at the screen in order to find out when it is worthwhile to look (Levin & Anderson, 1976; Lorch, Anderson, & Levin, 1979; Susman, 1978). Since 1970 research into children's memory and comprehension of television programs has developed rapidly. Both memory and comprehension are related to age. Older children remember more, remember in a more accurately structured fashion, and comprehend better than younger children.

An example of research which attempted to explore the relationships between filmic techniques and developmental processes is that of Salomon (1972, 1974, 1976, 1979). His attempts to demonstrate that filmic techniques like zooming, angle-change and close-ups can supplant cognitive skills demonstrate an original approach to the topic but his correlational data do not convincingly support his thesis. Rather, they suggest that the production techniques of television may supplement developmental processes.

This paper reports two experiments. The first tested methods for investigating children's memory for the sequence of events in a television program; the second examined the effects of a filmic technique (scene cuts) on memory.

EXPERIMENT 1

The aspects of memory considered in this experiment were recognition, recall, and reconstruction. Recognition is easier than recall and reconstruction falls between the two in difficulty (e.g., Piaget & Inhelder, 1973; Tower, Singer, Singer, & Biggs, 1979). Our object was to find an effective procedure for investigating memory which capitalised on these differences and avoided the procedural and

scoring difficulties which have bedevilled much work in the area of memory development, and memory for television programs in particular. Our procedure concentrated on recognition and reconstruction, using still photograhs from television programs which the children saw. The use of photographs has a number of advantages: photographs depict actual scenes, subjects have had equal exposure to them, and they are acceptable to a wide range of ages. That they are static images, and may emphasise the visual at the expense of the auditory components of the program may be disadvantages. In the recognition task subjects saw pairs of photographs and had to choose the one which had appeared in the program segment. Distractor photographs came from a segment of the same program which the subjects did not see. The reconstruction task required subjects to reconstruct the temporal order of events in the program segment they had seen. Subjects saw pairs of photographs and chose the one which had appeared first in the program segment. Since the children had only to indicate which one of a pair of photographs they selected, a simple response sheet could be used, and children as young as 6 years managed the procedure easily. The pairs of photographs were projected from slides, so that small group testing became possible. The number of correct judgments formed each child's score on each task.

Method

Subjects

Table 1

Subjects in Experiment 1

Age/Grade	N	Sex	Mean age	sd
1	30	15 boys 15 girls	6-8	3 mths
3	30	17 boys 13 girls	8-8	4 mths
5	33	19 boys 14 girls	10-8	4 mths
Adults	33	13 males 20 females	19-8	19 mths

The children were pupils at a Melbourne suburban state primary school. The adults were students at a tertiary college.

Material

The program. Children saw a 12 minute segment of a comedy-drama edited so that it began with the musical theme run in and ended with the theme conclusion. The segment included a number of scene changes but all formed a single on-going temporal sequence.

Recognition task. This consisted of six slides, each showing a pair of photograhs, each pair consisting of one photograph taken from the program segment shown to the subjects and one photograph from that part of the same program which the subjects did not see.

Reconstruction of temporal order (ROTO) task. This consisted of ten slides, each showing a pair of photographs from the program segment shown to the subjects. The pairs were made up from ten

photographs; each photograph appeared on two slides, once with a photograph adjacent to it in serial order, once with a photograph separated from it in serial order.

Table 2

ROTO Task Slides

Adjacent serial positions					Non-adjacent serial positions				
A	B	C	D	E	F	G	H	I	J
2	4	5	6	8	3	10	9	8	2
1	3	6	7	9	5	7	4	1	10

Procedure

Presentation and testing took place in schools and at college. Small groups of subjects saw the program segment, then saw the task slides and recorded their answers on an answer sheet by ticking one of a pair of boxes for each slide. About half the subjects at each age level did the Recognition task first and about half did the ROTO task first.

Expectations

1. Scores on both recognition and reconstruction tasks would be positively related to age.
2. Boys' and girls' scores would not differ.
3. Recognition task scores would be superior to ROTO task scores.
4. ROTO task scores would differ according to whether the photographs in pairs were adjacent or non-adjacent.
5. Scores would not differ as a function of task order.

Results

Table 3

Recognition and ROTO Task Scores

	Recognition task (Maximum score = 6)		ROTO task (Maximum score = 10)	
Age/Grade	Mean	Mode	Mean	sd
1	5.7	6.0	5.7	1.75
3	5.8	6.0	8.0	1.22
5	5.9	6.0	8.2	1.38
Adults	5.9	6.0	9.3	.92

Children performed much better on the recognition task than on the ROTO task: 77% of Grade 1 and over 90% of Grades 3 and 5 subjects achieved maximum recognition scores. Recognition and ROTO scores were subjected to a three-way analysis of variance (ANOVA) by age, sex and task order. Boys' and girls' scores did not differ significantly on either task, and task order did not produce a significant effect. ROTO scores differed significantly across age, $F(3, 110) = 38.30$, $p<.001$, although the means for Grade 3 and Grade 5 were very similar.

Table 4

ROTO Task: Mean and Standard Deviations of Adjacent and Non-Adjacent Scores

	Adjacent score (Maximum = 5)		Non-adjacent score (Maximum = 5)	
Age level	Mean	sd	Mean	sd
Grade 1 (n=30)	2.3	0.94	3.4	1.00
Grade 3 (n=30)	3.3	0.99	4.6	0.56
Grade 5 (n=33)	3.8	0.98	4.4	0.82
Adults (n=33)	4.6	0.60	4.7	0.64

Scores on the ROTO task were divided into an adjacent score and a non-adjacent score (see Table 4). A two-way repeated measures ANOVA (adjacent/non-adjacent x age) indicated that ROTO task performance differed according to composition of the slides, $F(1, 122) = 72.69$, $p<.001$, and slide composition interacted with age, $F(3, 122) = 10.14$, $p<.001$. Overall, children performed better on non-adjacent pairs, but the younger ones showed the greatest difference between adjacent and non-adjacent pairs.

When the slides were ranked according to the percentage of correct judgments, a recency effect appeared, i.e., the five slides with the highest percentage of correct judgments all contained photographs from towards the end of the segment. This is consistent with well established serial position effects (e.g., Murdoch, 1962; Norman, 1969). By contrast, the five slides with the lowest percentage of correct judgments contained photographs from the first half of the segment, i.e., no primacy effect appeared.

Implications

The ROTO task proved to be a satisfactory method for studying memory for the sequence of events in a television narrative. As well as being an economical and easily scored method of collecting data, it provided a way of comparing memory for sequences which differ in some significant features, for instance, different uses of production techniques such as cutting, zooming, close-ups, colour, and sound.

The recognition task did not discriminate well between the age groups, but showed that even 6 year old children retained a large well-differentiated store of images from the program segment.

The television program used was from a well known series, and familiarity with its characters and format may have inflated results. We decided that an unfamiliar program should be used to test this

possibility, to study further the effects of serial position, and to investigate the effects on memory of a common filmic technique, the use of cuts from one scene to another.

EXPERIMENT 2

A scene cut is an abrupt complete visual change from one spatial location to another; that is, film showing two different spatial locations is edited together. Frequency of scene cuts is related, but is not equivalent, to program pacing. Pacing includes frequency of scene cuts, but it also includes frequency of auditory change (e.g., from voice to music), amount of lively music, and pace of action (e.g., rate of talking and speed of movement) (Anderson, Levin, & Lorch, 1977). Pacing increases children's attention to the television screen (Anderson & Levin, 1976; Levin & Anderson, 1976) but apparently does not increase their comprehension of content (Friedlander, Wetstone, & Scott, 1974; Tower, Singer, Singer & Biggs, 1979). Tower et al. (1979) suggested that fast pacing used in programs like Sesame Street to increase attention may even hinder children's comprehension of program content. Other people (e.g., Anderson et al., 1977; Halpern, 1975) have asked whether rapid pacing overtaxes the perceptual and nervous systems of young children, giving rise to irritability, hyperactivty, and reductions in sustained effort. Anderson et al. (1977) tested preschool children's task perseverance and observed their play after the children had viewed either a fast or a slow paced version of Sesame Street; they found no immediate effects of pacing on the children's behaviour.

Frequency of scene cuts is a component of pacing that deserves study since it is used so extensively and for so many purposes: e.g., cutting manipulates time, backwards or forwards, or showing simultaneous events proceeding, and it transcends space by successively showing

different locations or different details of a single location without intervening transition views. The introduction of scene cuts for these and other purposes was a major innovation in the history of cinema. Children have little direct everyday experience which would enable them to interpret the instantaneous changes that occur on the screen, and their understanding of them might well be expected to follow a developmental sequence.

Method

Subjects

Table 5
Subjects in Experiment 2

Grade	N	Sex	Mean Age
Condition 1: Few Cuts			
1	45	22 boys 23 girls	7-1
3	45	25 boys 20 girls	8-11
5	45	20 boys 25 girls	10-11
Adults	45	6 males 39 females	Median Age: 20-9
Condition 2: Many Cuts			
1	45	20 boys 25 girls	7-0
3	45	19 boys 26 girls	8-10
5	45	21 boys 24 girls	11-0
Adults	45	8 males 37 females	Median Age: 22-1

Material

The program. A children's science fiction drama, which had not been shown in Australia, was chosen for this experiment. Two segments were edited so that they began with the theme run-in and ended with the theme conclusion. Each segment was between nine and ten minutes in duration. One segment had six scene cuts and three locations (Few Cuts); the other had 28 scene cuts and five locations (Many Cuts). The segment with many cuts immediately followed the Few Cuts segment in the program, and showed the same characters.

Recognition task. For each experimental condition (Few/Many Cuts) there were two recognition tasks: Recognition A and Recognition B. In Recognition A, six slides showed pairs of photographs, one of which came from the segment seen (positive element), the other came from the segment not seen (negative element). Recognition B used the same photographs as Recognition A, but the composition of the six slides differed: in two slides both elements were positive, in two slides both were negative, and in two slides one element was positive and one was negative.

ROTO task. The ROTO task for each condition consisted of ten slides each showing two photographs. On five slides the photographs were separated by relatively short time intervals (24 to 144 seconds); these were called Short Temporal Separation (STS) slides. On five slides the photographs were separated by relatively long time intervals (310 to 348 seconds); these were called Long Temporal Separation (LTS) slides.

Procedure

Table 6

Allocation of Subjects to Conditions and Tasks

	Experimental condition			
	Few Cuts		Many Cuts	
	N at each age level	Total N	N at each age level	Total N
Recognition A task	20	80	20	80
Recognition B task	25	100	25	100
ROTO task	45	180	45	180
Total	45	180	45	180

Subjects were tested in small groups as in Experiment 1. The scoring was done in the same way as before except that on the Recognition B task each subject's performance was scored on the number of photographs correctly recognised (correct acceptance score) and the number of photographs correctly rejected as not having appeared in the program segment (correct rejection score).

Expectations

1. Scores on both recognition tasks and on the ROTO task would be positively related to age.
2. Scores would differ according to whether the segment had few or many scene cuts.

3. Boys' and girls' scores would not differ.
4. Performance on the Recognition A task would be superior to performance on the Recognition B task.
5. On the Recognition B task subjects would correctly accept and correctly reject elements equally often.
6. On the ROTO task scores for LTS slides would be superior to scores for STS slides.

Results

Recognition Tasks

Mean scores on both Recognition A and Recognition B tasks were analysed using three-way ANOVAS (age x sex x experimental condition). Significant age differences occurred on Recognition A, $F(3, 145) = 15.45$, $p<.001$, and Recognition B, $F(3, 184), = 11.10$, $p<.001$. Neither sex nor experimental condition was a significant main effect in these analyses.

Table 7

Mean Scores on Recognition Tasks

	Experimental condition							
	Few Cuts				Many Cuts			
	Recog. A		Recog. B		Recog. A		Recog. B	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Grade 1	4.4	1.6	8.0	1.61	4.1	1.07	8.0	1.62
Grade 3	5.3	.80	9.0	1.44	5.5	1.00	8.9	1.58
Grade 5	5.8	.44	9.6	1.29	5.4	.99	9.0	1.78
Adults	5.6	.76	9.8	1.52	5.3	.72	9.6	1.38
	(Max. = 6)		(Max. = 12)		(Max. = 6)		(Max. = 12)	

On the Recognition B task subjects' performance was measured in terms of a correct acceptance score and a correct rejection score (see Table 8). Using a three-way repeated measures ANOVA (correct acceptance/correct rejection x age x experimental condition) a significant difference occurred between correct acceptance and correct rejection scores, $F(1, 192) = 16.89$, $p<.001$. Acceptance/Rejection interacted significantly with age $F(3, 192) = 10.65$, $p<.001$, and with experimental condition, $F(1, 192) = 49.84$, $p<.001$.

Table 8

Mean Correct Acceptance and Rejection Scores On Recognition B Task

	Correct acceptance				Correct rejection			
	Few Cuts		Many Cuts		Few Cuts		Many Cuts	
	Mean	sd	Mean	sd	Mean	sd	Mean	sd
Grade 1	4.2	.96	4.7	.98	3.8	1.26	3.2	1.17
Grade 3	4.6	.76	5.2	.82	4.4	1.08	3.7	1.37
Grade 5	4.3	.75	5.1	1.09	5.2	.83	3.9	1.13
Adults	4.7	.94	4.8	.94	5.3	.85	4.8	1.16

Acceptance scores tended to be higher than rejection scores, and rejection scores increased with age more than acceptance scores. Acceptance scores were higher for the Many Cuts segment than for the Few Cuts segment, while rejection scores were higher for the Few Cuts segment than for the Many Cuts segment.

In order to compare performance on the two recognition tasks, subjects' success in differentiating the positive elements from the negative elements in the Recognition A task was compared with their success in accepting or rejecting those elements in the Recognition B task. There was a tendency for more subjects to respond correctly to a Recognition A photograph pair than to either the positive or negative elements individually in the Recognition B task. Quite marked differences occurred between individual photographs (see Figure 1).

ROTO Task

A three-way ANOVA (age x sex x experimental condition) was applied to subjects' ROTO scores; significant age differences occurred, $F(3, 334) = 20.60$, $p < .001$, and a significant interaction between sex and experimental condition, $F(1, 344) = 9.23$, $p < .05$.

Overall, scores on the ROTO task increased with age up to Grade 5. On the Few Cuts segment males scored better than females, but on the Many Cuts segment females scored better than males. These differences held over all age levels for males and over three of the four age levels for females (see Figures 2 and 3).

Mean scores for STS slides and LTS slides are shown graphically in Figure 4. The figure illustrates several points:

1. Overall performance increased from Grade 1 to Grade 5 but decreased from Grade 5 to adulthood.
2. LTS scores were higher than STS scores at each age level.
3. Differences between LTS scores and STS scores were much larger for the Many Cuts segment than for the Few Cuts segment.
4. On the Few Cuts segment males scored higher than females.

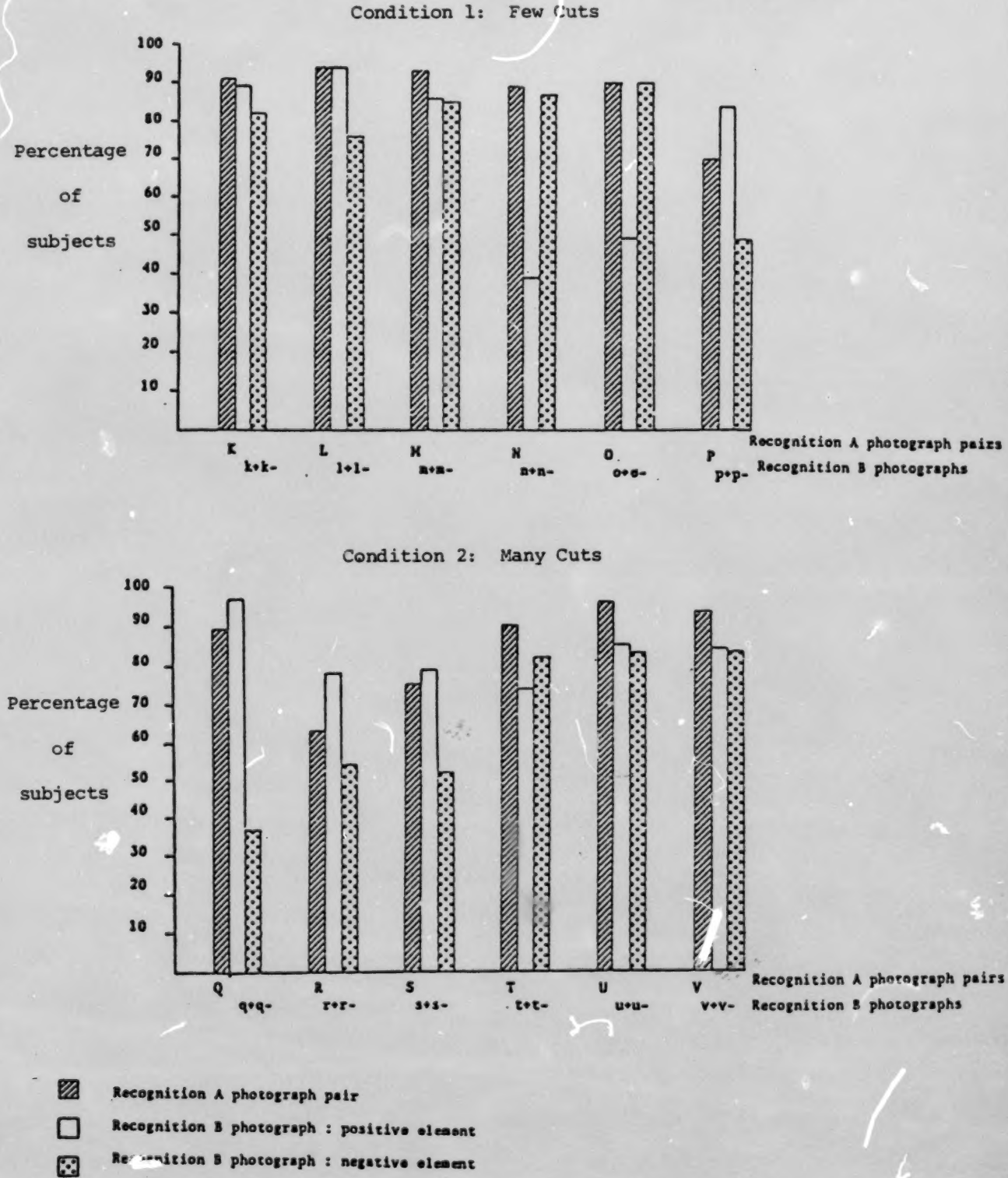

Figure 1. Comparison of percentage of subjects correct on Recognition A task photograph pairs and the percentage of subjects correct on the corresponding Recognition B task photographs.

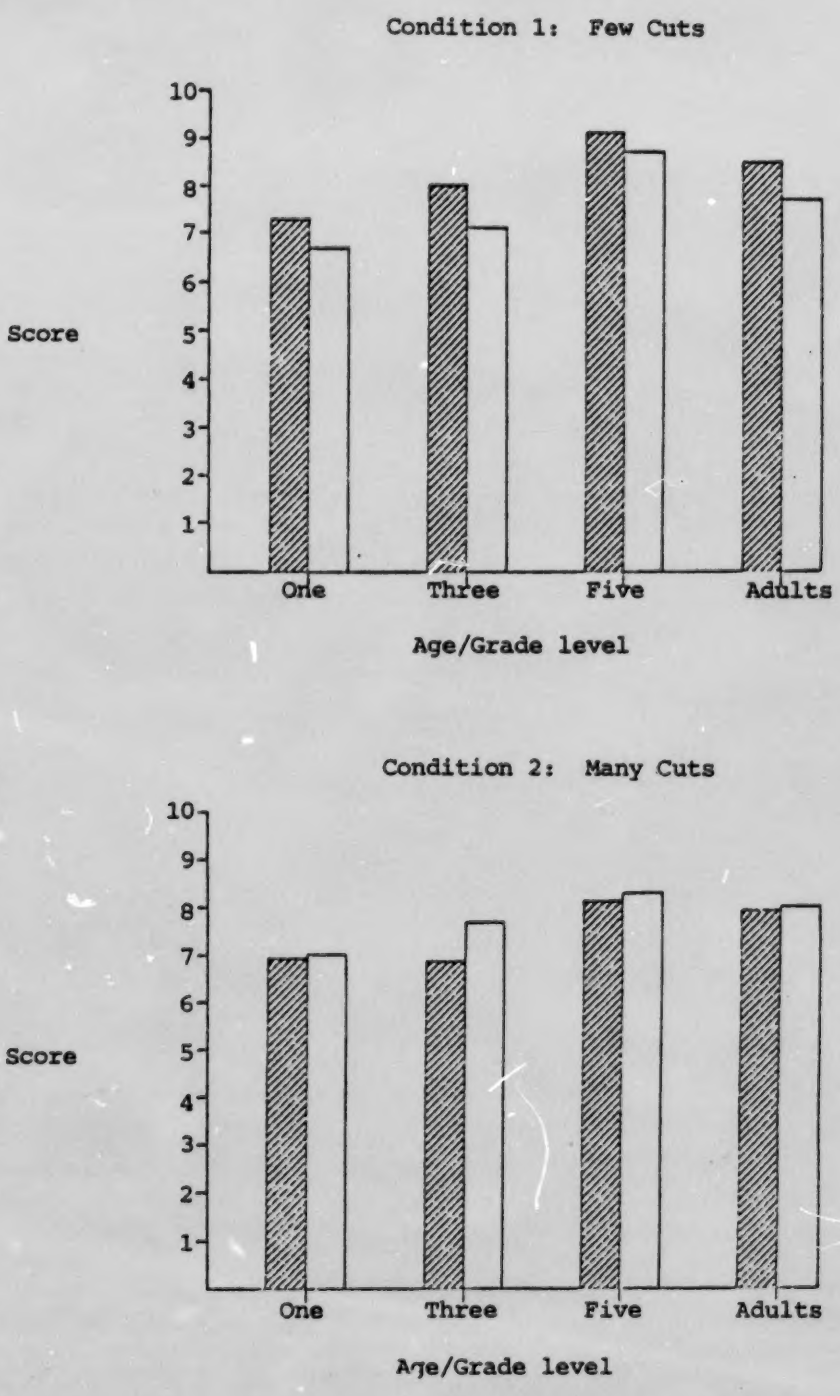

Figure 2. ROTO task: Mean ROTO scores according to sex of subjects (maximum score = 10).

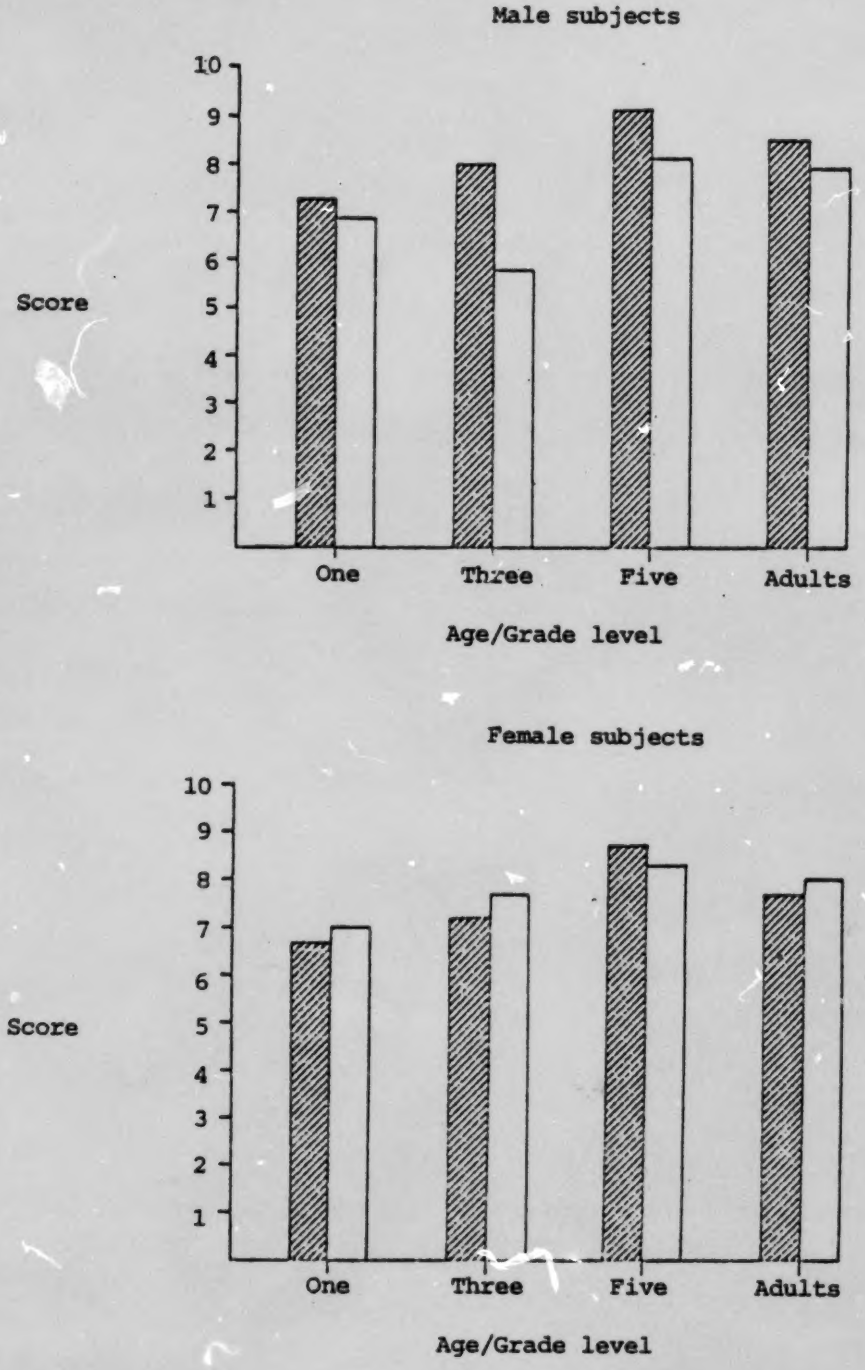

Figure 3. ROTO task: Mean ROTO scores according to each experimental condition (maximum score = 10).

A four-way repeated measures ANOVA (STS/LTS scores x experimental condition x age x sex) was applied to test the significance of these differences. Highly significant differences occurred between age groups $F(3, 344) = 17.65$, $p<.001$, and between LTS scores and STS scores, $F(1, 344) = 129.56$, $p<.001$. A significant interaction occurred between LTS/STS scores and experimental condition, $F(1, 344) = 15.72$, $p<.001$; weak but significant interactions occurred between experimental condition and sex, $F(1, 344) = 8.60$, $p<.05$, and amongst sex, age and LTS/STS scores, $F(3, 344) = 4.25$, $p<.05$.

Performance across photograph pairs in condition 1 (Few Cuts) and condition 2 (Many Cuts) is shown in Figures 5 and 6 respectively. In both conditions more correct responses occurred on photograph pairs which contained photographs from towards the end of the program segment (e.g., serial positions 9, 10). While the effect is not clear, fewer correct responses occurred on photograph pairs which contained photographs from the beginning of the program segment (e.g., serial positions 1, 2, 3, 4). This effect is compounded with temporal separation and probably with the dramatic content and vividness of the photographs.

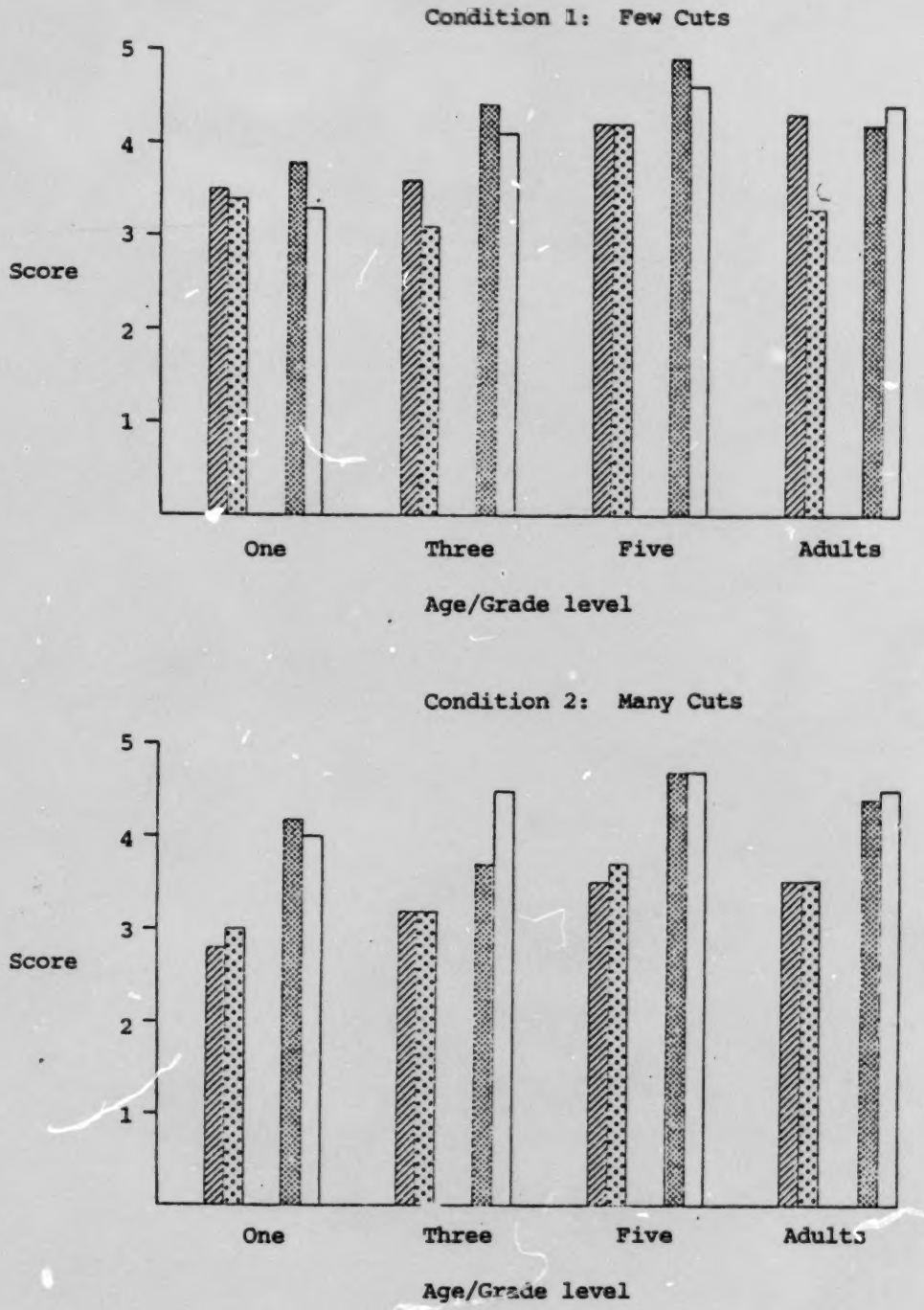

Figure 4. ROTO task: Mean STS and LTS scores (maximum score = 5).

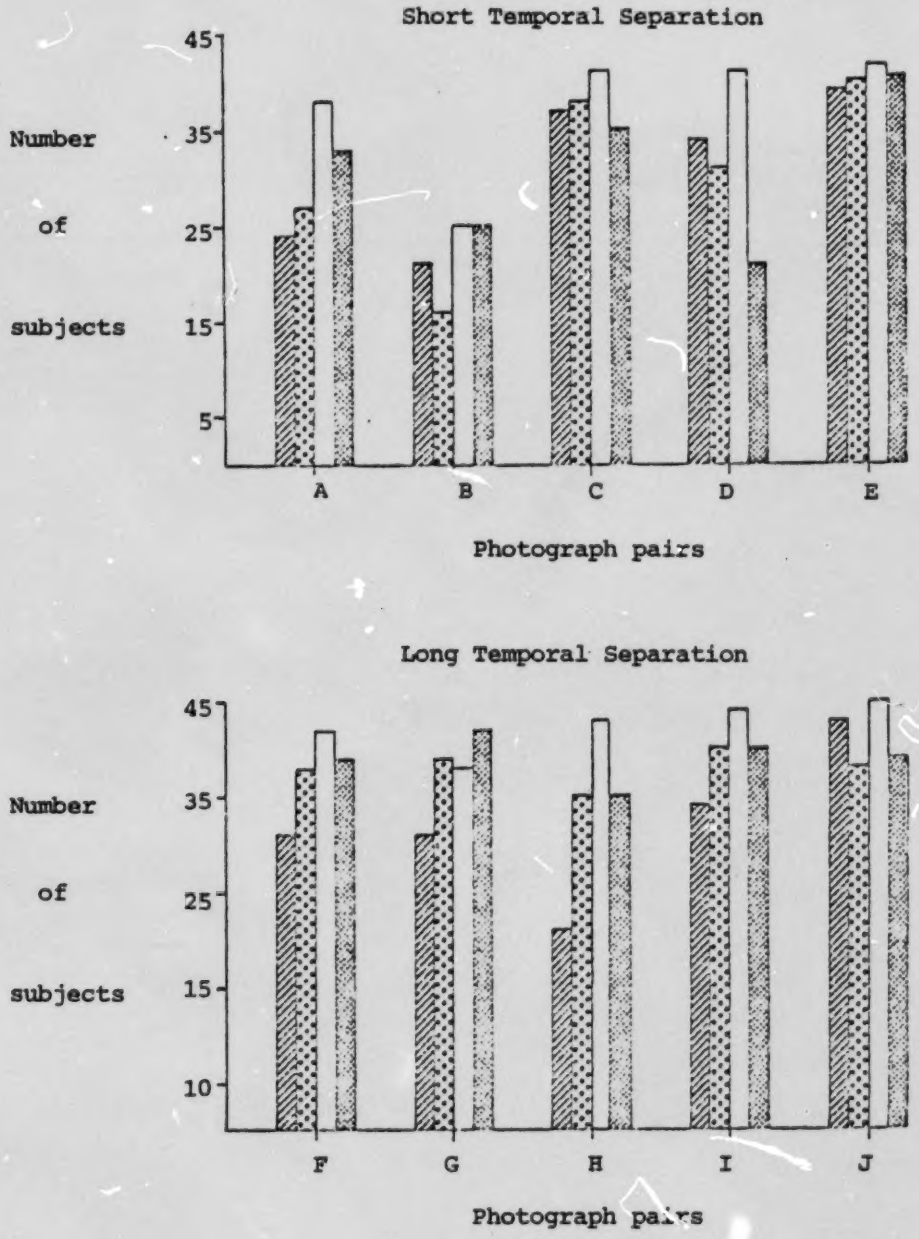

Figure 5. ROTO task, condition 1 (Few Cuts): Number of subjects correctly responding to each photograph pair according to age level.

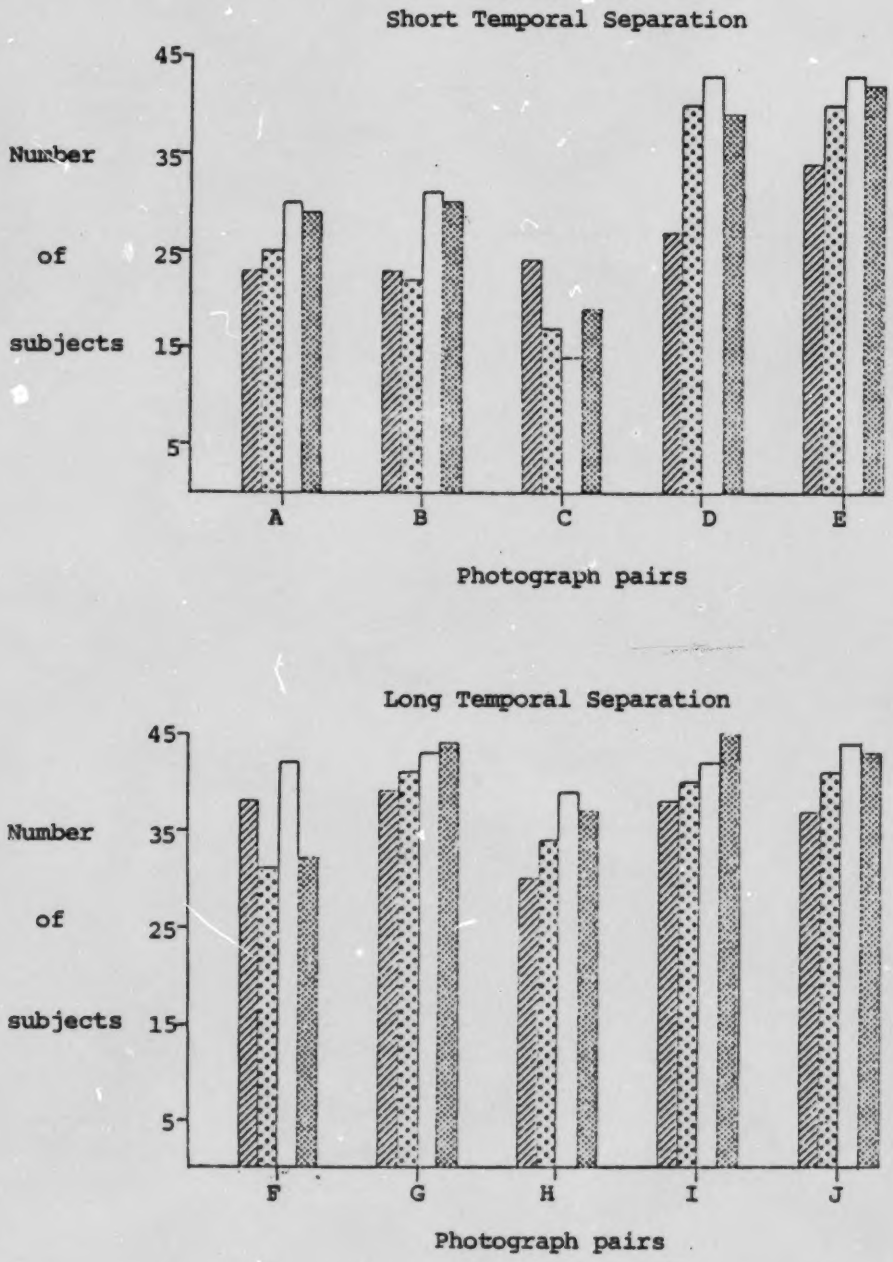

Figure 6. ROTO task, condition 2 (Many Cuts): Number of subjects correctly responding to each photograph pair according to age level.

Summary of Results

Experiment 1

1. All subjects, regardless of age, accurately recognised photographs taken from the program segment they had seen and rejected distractor photographs, when shown a pair containing one positive and one negative element.
2. Subjects' ability to reconstruct the temporal order of events in a program increased with age from 6 years to adulthood; the largest increase occurred between 6 and 8 years.
3. Males and females did not differ on either recognition or reconstruction of temporal order.
4. Subjects performed better on recognition than on reconstruction of temporal order, but adults performed well on both tasks.
5. Subjects were more accurate in judging temporal order when the photographs on the slide were from non-adjacent serial positions than when they were from adjacent serial positions.
6. Subjects' scores did not differ as a function of task order.

Experiment 2

1. Recognition improved with age for both tasks, but when subjects had to judge each photograph for its familiarity, instead of selecting one out of two as familiar, the effect increased.
2. Reconstruction of temporal order increased with age from 6 to 10 years, but adults did no better than the 10 year olds.
3. Males and females did not differ on the Recognition tasks.
4. Subjects performed better on the Recognition A task than on the Recognition B task.
5. On the Recognition B task subjects were better at accepting photographs correctly than at rejecting them correctly; ability to reject correctly increased more with age than ability to accept correctly.

6. Few or Many Cuts did not produce a significant main effect but interacted significantly with correct acceptance/rejection on the Recognition B task: subjects correctly accepted more photographs from the Many Cuts segment and correctly rejected more which had not appeared in the Few Cuts segment. Few/Many Cuts also interacted significantly with sex on the ROTO task. Males reconstructed temporal order better for the Few Cuts segment, while females reconstructed temporal order slightly better for the Many Cuts segment.
7. Subjects were better at making temporal judgments with LTS slides than with STS slides, especially on the Many Cuts segment.
8. Subjects made more accurate judgments about temporal order when photographs came from towards the end of the segment than when they came from the beginning or middle: i.e., a recency but not a primacy effect occurred.

Discussion

The methods developed are suitable for a wide range of ages and make it possible to study the effects of both thematic content and filmic techniques on memory. The findings are consistent with models of memory development proposed by Brown (1975) and Flavell (1977); i.e., memory development is a function of age-related improvements in three phenomena related to memory: (a) knowledge, (b) abilty to use strategies for efficient memory performance, and (c) metamemory. The age trends found in our work probably depend heavily on knowledge about television programs and techniques, the older children and the young adults having accumulated much more experience and hence knowledge of the medium. Differences between recognition and reconstruction showed that younger children lacked the strategies which enabled the older

subjects to organise their store of memories and to reconstruct the temporal order of program events. Since subjects did not know the nature of the tasks when they saw the program segments they could not develop specific strategies during viewing. The procedure probably reduced the effects of age-related differences in metamemory, but gave opportunities for memory strategies already in existence to show themselves in age differences.

That the segment with many scene cuts was so well remembered is consistent with much work on Sesame Street, and does not support the notion that fast pacing is harmful to memory. Our results, in fact, imply that even 6 year olds are efficient and sophisticated in their viewing and retain a highly differentiated store of memories from it.

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Presentation Medium and Story Comprehension in Young Children

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Stories provide children with information and entertainment, and do so through many different media (e.g., books, strip cartoons, television, radio, film). Recent research has suggested that characteristics of the medium in which a story is presented affect children's understanding of the story. The aim of this study was to compare young children's memory and comprehension of a story presented in two different media: picture book and television cartoon. The effects of age, story content, and serial position on memory per se, and the interaction between these variables and medium, were also investigated. Children aged 4-6 years were shown either the book or the cartoon and then did two tasks: a Reconstruction of Temporal Order (ROTO) task, in which they were shown pairs of photographs taken from the story and had to judge which one came first; a comprehension task, consisting of five open-ended questions. A slight medium effect in favour of TV subjects appeared on both tasks, but this was generally not significant. Age differences appeared on the comprehension task but not on the ROTO task. Story content was significantly related to performance on the ROTO task and interacted with medium on both tasks. Scores on the ROTO task were not affected by the serial position of photographs in the story narrative, but there was an unexpected interaction between serial position and presentation medium. Results are discussed in terms of inherent structural differences between the two media and the effects of structural features on the rendering of story content. Methodological issues are also considered.

Stories play an important part in children's intellectual, social and emotional development: they transmit knowledge about culture and society; they record history; they teach ideas and basic concepts; they provide entertainment and relaxation; they are sources of fantasy and creative activities. The perceived influence of stories on children's development has prompted researchers to look for factors which affect how well children understand and remember stories. Research has shown that accurate memory and understanding of the gist of stories depend upon age-related factors such as memory capacity, selective attention skills, rehearsal strategies, world knowledge, expectations of story structure, ability to reason beyond the information given, and ability to co-ordinate the temporal and causal relations between story events.

Similar factors have been found to affect children's memory for television narratives (e.g., Collins, 1970; Knowles, 1979; Rendell, 1981), and their understanding of the motivations and feelings of television characters (Collins, Berndt, & Hess, 1974; Leifer, Collins, Gross, Taylor, Andrews, & Blackmer, 1971).

Some researchers (e.g., Salomon, 1979) have suggested that characteristics of the medium in which narratives are presented also play an important part in determining children's understanding of them. Structural features of television such as pacing, audio techniques, and camera techniques have been found to influence children's attention to the screen, their comprehension of content, and their post-viewing social behaviour (Anderson & Levin, 1976; Anderson, Levin, & Lorch, 1977; Singer & Singer, 1979).

There is, however, a dearth of empirical research dealing with structural differences between media and how these interact with learning and behaviour. Stories routinely cross media boundaries but little is known about the unique strengths and limitations of media and how these can be adapted to maximize understanding. Research of this type could be usefully applied to areas such as education and television production.

Past studies involving intermedia comparisons have been beset with methodological problems. Baggett (1979) compared adults' recall of a movie without dialogue and a text story which was similar to the movie in episodic structure, but differed in content and length. Wetstone and Friedlander (1974) attempted to look at the effect of medium on children's comprehension of a story using a live storyteller, a videotape of the storyteller, or an audiotape of the storyteller. The video stimulus, though, did not contain the moving imagery or the dense pictorial display which distinguishes television from other media.

Meringoff (1980) used a more controlled design to compare 8-10 year old children's comprehension of an unfamiliar story either read to them from a picture book, or presented as a television cartoon. Comprehension and memory for the story were assessed using various methods: free recall, picture ordering, and open-ended questioning.

A common feature of these studies is the use of free recall or open-ended questioning to assess story recall and comprehension. The work of Brown (1975) has shown that recall by children under 8 years of age improves significantly when assessed with non-verbal tasks such as recognition or reconstruction of pictures depicting story events. Protocols obtained by free recall or by written or oral responses to open-ended questions are inadequate for the following reasons: they cannot be elicited from very young children who have limited symbolic and language skills; they are difficult to score. An alternative to verbal tasks - arranging pictures of story events in temporal order - has been used by Leifer et al. (1971) and by Meringoff (1980). Picture ordering is an advance over verbal measures, but it too has problems: it is a cumbersome task for young children; it assumes ability to scan a stimulus array systematically; arrangements of pictures which are not perfect are difficult to score.

A task which overcomes these problems was used by Rendell (1981) to measure children's memory for the temporal order of events in a television segment. Subjects were shown pairs of photographs from the segment and were asked to select the photograph which came first. The procedure was based on a psychophysical paradigm - The Method of Paired Comparisons - developed by Thurstone (1927). The method employs a set of stimuli, defined in terms of some physical or social dimension, and an exhaustive pairing of stimuli within the set. The method has a number of advantages over more conventional methods used in cognitive-developmental research:

subjects can respond to a standard question by pointing; only two stimuli have to be scanned at a time; the relative difficulty of individual stimuli can be easily assessed.

Meringoff's study provided the impetus for the present study, although our major aim was to investigate the influence of the medium on younger children's story comprehension, using more structured and valid response measures. An exhaustive paired comparisons task was developed to assess 4-6 year olds' memory for events in a story presented either as a picture book or a television cartoon. The task was based on the paradigm used by Rendell (1981), although his stimuli were not paired exhaustively; exhaustive pairing ensures that the differences between stimuli on a given dimension are varied systematically.

The paired comparisons paradigm also provided a means by which the interaction between medium and serial position effects in memory could be studied. Primacy and recency effects (better recall of items near the beginning and end) are commonly found in memory for word and number lists (Norman, 1969). Rendell (1981), though, found a recency but not a primacy effect in children's memory for events in a television narrative.

The story used in this study provided an opportunity to look at memory for auditory and visual content separately. The theme of the story was conveyed primarily by a means of a visual rather than a verbal narrative; major story events were not referred to in the brief verbal narrative. The relative influence of auditory and visual input on children's attention and memory is a contentious issue. Some studies have claimed that children processing static pictorial or televised information focus their attention on the visual input and ignore the auditory input (Hayes & Birnbaum, 1980; Hayes & Schulze, 1977); others have claimed that auditory features are important determinants of patterns of attention (Lorch, Anderson, & Levin, 1979).

Method

Subjects

One hundred and four children took part in the study. Forty-eight children were preschoolers (mean age = 4 years 5 months), 56 children had just begun their first year of school (mean age = 5 years 3 months). The children attended either suburban preschools or state primary schools. Children from each age group were randomly assigned to one of the two experimental conditions, book or TV.

Stimulus Materials

The story. The story used in this study was called "Rosie's Walk". It was about a hen called Rosie who went for a walk around her farm without knowing she was being followed by a fox who was trying to catch her. Unwittingly she led the fox into one disaster after another; each time the fox recovered but he was unable to catch the hen before she got back to her house. The visual narrative of the story consisted of a number of action sequences involving Rosie and the fox. Each action sequence occurred in a different context, featured an attempt by the fox to catch Rosie, and the outcome of that attempt. The verbal narrative of the story outlined the places Rosie went to on her walk but did not refer to the fox, or his actions, at all.

The story was presented in one of two forms: a 15 page picture book, with colour illustrations on every page and brief narrative statements on alternate pages; a 2 minute animated cartoon with an American narration. To equate style of presentation across media, a narration by the experimenter was dubbed over the original soundtrack.

The story was suited to this study for the following reasons: it was short, amusing and appropriate for young children; the graphics of the TV and book were highly similar.

The reconstruction of temporal order (ROTO) task. The ROTO task utilized 12 still colour photographs taken from either the book or the TV. The photographs which were selected sampled the entire time span of the story and each one depicted an event which was central to the story theme.

The photographs were numbered serially according to their temporal order in the story. The major sequence of 12 photographs was then divided into three sub-sequences, each with four photographs. Sub-sequence R contained photographs of Rosie; Sub-sequence B contained photographs of Rosie and the fox and depicted attempts by the fox to catch Rosie; Sub-sequence F contained photographs of the fox and depicted outcomes of the fox's attempts. Each photograph was paired with every other photograph in its sub-sequence, resulting in six photograph pairs in each sub-sequence, 18 pairs in all.

Within each pair, photographs were positioned so that: (a) they were one below the other, (b) no photograph appeared more than twice on the top or twice on the bottom, and (c) the correct photograph appeared an equal number of times on the top and bottom (see Table 1). The order in which photograph pairs were presented was not entirely random; in order to reduce the likelihood of learned position effects, the same photograph did not appear in successive pairs, and the correct photograph was not in the same position in more than two successive pairs.

Subjects were presented with the 18 photograph pairs, one at a time, and had to point to the photograph which came first in the story. Two initial practice items were given to familiarize subjects with the task and to indicate that relative rather than absolute judgements of "first" were required.

The comprehension task. The comprehension task consisted of five questions which required either yes/no or short answers. On two questions subjects had to describe a dramatic story event which was not referred to

in the verbal narrative; they were presented with a photograph of the event and were asked "What happened in this picture?" The other three questions required subjects to make inferences about content which was implicit in the ongoing narrative: one question concerned the outcome of the fox's actions; the other two concerned characters' motives.

Procedure

Subjects were tested individually in a small room close to their normal classroom. Subjects were either read the book or watched the television cartoon. Presentation of the book was standardized to 2 minutes to match the cartoon. Immediately following the presentation subjects completed the ROTO task and the comprehension task.

In a separate testing session subjects completed the Peabody Picture Vocabulary Test (Dunn, 1965) which measures children's hearing vocabulary. This provided an estimate of verbal ability.

Table 1

Arrangement of Photograph Pairs in the ROTO Task

Sub-sequence R (Rosie)

Serial position of photographs in major sequence:	2	7	10	12		
Photograph pairs:	10	7	12	2	12	7
	2	12	2	7	10	10

Sub-sequence B (Both)

Serial position of photographs in major sequence:	4	6	9	11		
Photograph pairs:	6	6	11	4	11	9
	9	4	4	9	6	11

Sub-sequence F (Fox)

Serial position of photographs in major sequence:	1	3	5	8		
Photograph pairs:	8	1	5	1	3	3
	5	5	3	8	1	8

Expectations

1. Book and TV subjects would perform differently on both the ROTO and comprehension tasks.
2. Five year olds would perform better than 4 year olds on both tasks.
3. On the ROTO task Sub-sequence R, F, and B scores would differ.
4. Sub-sequence R, F, and B scores would be related to medium.
5. Memory for photographs in the ROTO task would not be affected by a photograph's serial position.
6. Performance on the comprehension task would be positively related to verbal ability but performance on the ROTO task would not.

Results

ROTO Task Scores

Each subject's ROTO score was the total number of photograph pairs in which temporal order was judged correctly. The mean ROTO score for the the entire sample was 10.8 - an average hit rate of 60%. Although the mean was not high, it was significantly above chance level. ROTO scores varied only slightly as a function of age, sex or medium (see Table 2). Medium differences were more apparent when the ROTO scores were plotted in a frequency distribution: Figure 1 shows that the most frequent score obtained by book subjects was nine, but for TV subjects the most frequent score was 12. In addition, TV subjects' ROTO scores were more skewed toward the upper range than were book subjects' scores. A three-way analysis of variance (ANOVA) performed on all subjects' ROTO scores showed no significant main effects of age group, sex, or medium and no significant interactions.

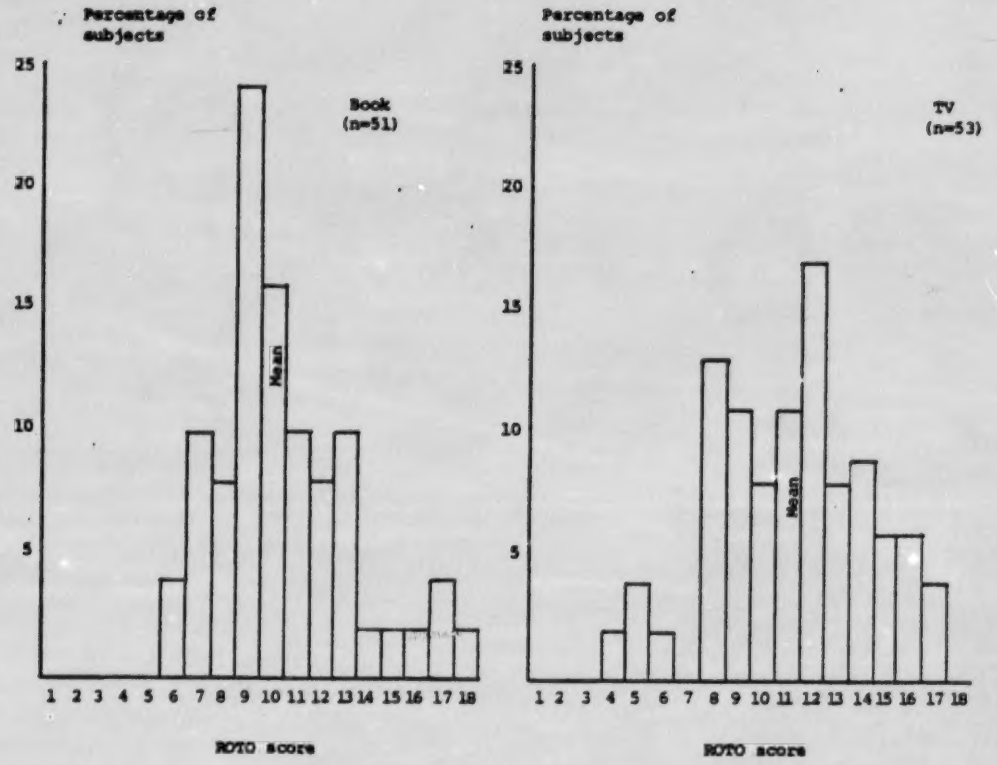

Figure 1. Percentage of book and TV subjects obtaining each ROTO score.

Table 2

Mean Scores on ROTO Task

		ROTO score (Maximum = 18)	
		Mean	s.d.
ENTIRE SAMPLE		10.8	2.97
AGE GROUP	4 year olds	10.4	3.19
	5 year olds	11.2	2.79
SEX	Male	11.1	2.78
	Female	10.6	3.12
MEDIUM	Book	10.4	2.83
	TV	11.2	3.10

ROTO scores were divided into three scores, one for each sub-sequence (see Table 3). Subjects performed slightly better on photographs from Sub-sequence R than on photographs from Sub-sequences F or B. To test the significance of differences between pairs of sub-sequence means a *t*-test for paired samples (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975) was performed. The only significant difference was between Sub-sequence R and Sub-sequence F means, $t(103) = 2.35$, $p < .02$.

Sub-sequence scores were then broken down by age group and medium (see Table 3). A significant medium difference appeared on Sub-sequence F scores, with TV subjects performing better than book subjects, $F(1,96) = 4.40$, $p < .04$.

Table 3

Mean Sub-Sequence scores on ROTO Task

		Sub-sequence R score (Maximum=6)		Sub-sequence F score (Maximum=6)		Sub-sequence B score (Maximum=6)	
		Mean	s.d.	Mean	s.d.	Mean	s.d.
ENTIRE SAMPLE		3.8	1.45	3.4	1.28	3.6	1.28
AGE GROUP	4 year olds	3.4	1.35	3.3	1.36	3.6	1.30
	5 year olds	4.1	1.48	3.4	1.40	3.6	1.28
MEDIUM	Book	3.7	1.35	3.2	1.26	3.6	1.32
	TV	3.9	1.55	3.7	1.27	3.6	1.26

In order to look at differences in memory performance across photographs in the ROTO task the percentage of correct judgements made for each photograph was calculated. The percentages are represented graphically in Figure 2. Neither of the curves shown resembles the typical bow-shaped serial position curve; the peaks are evenly spread, suggesting that judgements of temporal order were affected by factors other than serial position. There is, however, a difference between the two curves: book subjects judged temporal order less accurately than TV subjects for photographs in the first half of the sequence, the most marked effects occurring on photographs 2, 3 and 5.

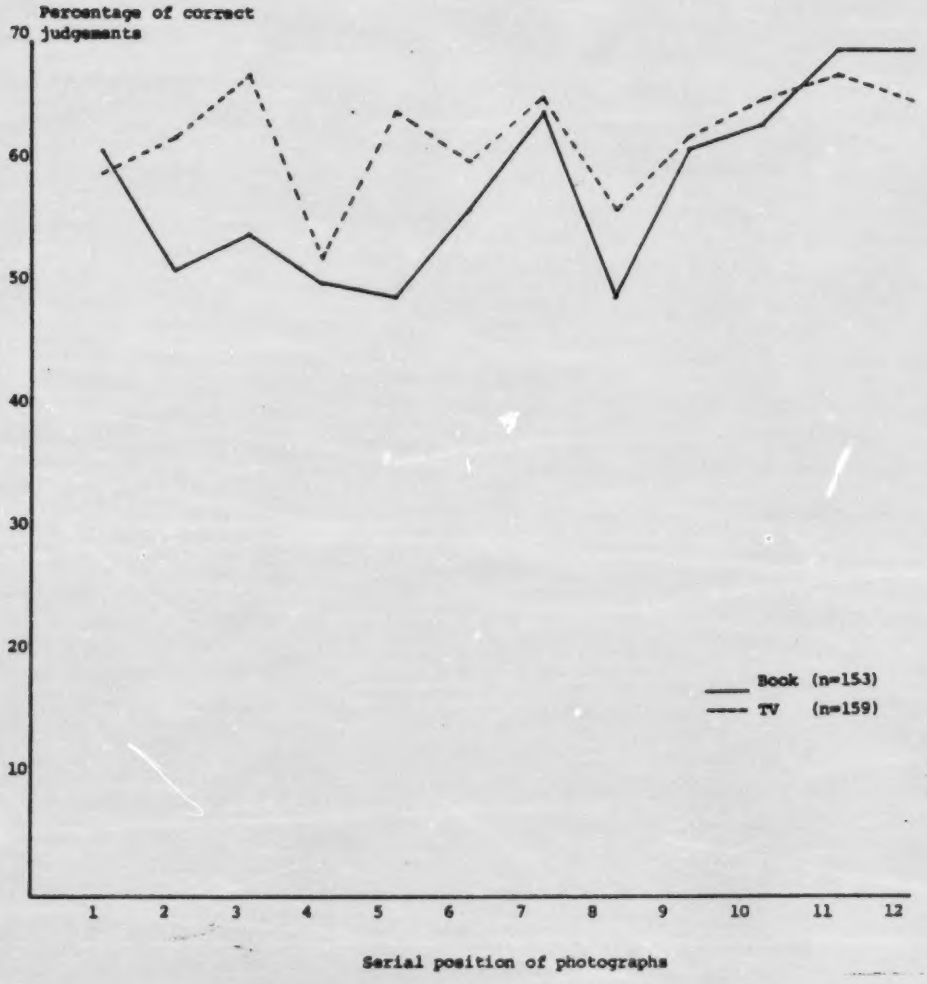

Figure 2. Percentage of correct judgements by book and TV subjects for individual photographs.

Comprehension Task Scores

Scores on the five comprehension questions were added to give a total score out of six: four questions were scored dichotomously (correct = 1, incorrect = 0); correct answers to the fifth question were scored as either 1 or 2 depending on their complexity. The mean score for the entire sample was relatively high, and differences between age and media groups appeared (see Table 4). A three-way ANOVA of all subjects' comprehension scores by age group, sex, and medium indicated that age group was the only significant main effect, $F(1,96) = 12.55$, $p < .01$. When intragroup age differences were controlled for, medium was a low but significant main effect, $F(1,95) = 3.89$, $p < .05$. No significant interactions between the variables were found.

Table 4

Mean Scores on Comprehension Task

		Comprehension score (Maximum = 6)	
		Mean	s.d.
ENTIRE SAMPLE		4.1	1.68
AGE GROUP	4 year olds	3.5	1.86
	5 year olds	4.6	1.33
SEX	Male	4.1	1.81
	Female	4.1	1.58
MEDIUM	Book	3.8	1.67
	TV	4.4	1.66

Comprehension scores were positively correlated with scores on the Peabody Test, Pearson $r = .25$, $p < .005$.

Tables 5 and 6 show percentages of correct responses to each comprehension question by age group and medium respectively. Significant age differences appeared on question 1, $x^2(1) = 8.4$, $p < .01$, and

question 5, $\underline{x}^2(1) = 10.6$, $p<.001$; five year olds showed a ceiling effect on both of these questions. Question 2, comprehension of a dramatic event, was answered correctly by about only 50% of subjects in each age group. Nevertheless, TV subjects performed significantly better than book subjects on this question, $\underline{x}^2(1) = 12.5$, $p<.0004$.

Table 5

Percentage of Correct Responses to Individual Comprehension Questions by Age Group

	Age group	
	4 year olds	5 year olds
Question	%	%
1. Comprehension of photograph 11	58	84
2. Comprehension of photograph 3	52	48
3. Inference - motives	54	70
4. Inference - motives	50	72
5. Inference - outcome	79	100
	(n=48)	(n=56)

Table 6

Percentage of Correct Responses to Individual Comprehension Questions by Medium

	Medium	
	Book	TV
Question	%	%
1. Comprehension of photograph 11	67	77
2. Comprehension of photograph 3	31	68
3. Inference - motives	61	64
4. Inference - motives	69	63
5. Inference - outcome	90	91
	(n=51)	(n=53)

Summary of Main Results

ROTO Task

1. Subjects scored above chance level on the ROTO task.
2. TV subjects performed better than book subjects but the differences were not statistically significant.
3. Performance was not related to either age group or sex.
4. Sub-sequence R photographs were remembered significantly better than Sub-sequence F photographs, but not significantly better than Sub-sequence B photographs.
5. Sub-seqeuence F photographs were remembered better by TV than by book subjects.
6. Memory for individual photographs did not vary systematically as a function of their serial position.

7. Significant medium differences occurred for photographs in the first half of the sequence but not for photographs in the last half of the sequence.
8. ROTO scores and verbal ability were not significantly correlated.

Comprehension Task

1. Five year olds performed significantly better than four year olds and showed a ceiling effect on two questions.
2. TV subjects performed better than book subjects overall, but this trend was significant only when age differences were controlled.
3. A significant medium difference occurred on one comprehension question.
4. No sex differences were found.
5. Comprehension scores and verbal ability were significantly correlated.

Discussion

In general, the television version of the story was remembered and comprehended slightly better than the book version. It was hypothesized that the continuous, dynamic visual imagery of the television story would result in a more vivid memory of the events and a more complete understanding of the causal and temporal relationships between events. The rather small overall difference obtained probably occurred because the advantages and disadvantages of each medium were equally balanced. For instance:

1. The book and the television cartoon were very similar in terms of length, verbal narrative, and the graphics of the visual images.
2. The speed and linearity of the television story allowed less time for subjects to reflect upon what they had seen or to integrate the material with their own memories and thoughts, and less opportunity to engage in mnemonic activities such as rehearsal, pausing, or verbal labelling.

3. The continuity of the imagery in the television story created more visual information to process, which in turn, might have made it more difficult to process the verbal narrative.
4. The static and less complex imagery of the book allowed subjects more opportunity to follow the verbal narrative covertly, or to rehearse it aloud, and more time for parallel processing of the pictures and verbal labels.
5. The static photographs used in the ROTO task favoured book subjects over TV subjects because they restated events in the book more accurately.

Story content was related to performance on the ROTO task. Subjects remembered photographs of Rosie, which depicted events referred to in the verbal narrative, better than photographs of the fox, which depicted events not referred to in the verbal narrative. This is noteworthy since most of the dramatic and central story events featured the fox. It suggests that the verbal narrative was encoded along with the visual narrative and provided cues for recalling aspects of the visual narrative. It also supports the notion that verbal input is monitored closely, even in a story where it plays little or no part in the developing theme.

As expected, memory for the sub-sequences of photographs was significantly related to medium. Photographs from Sub-sequence F (Fox) were remembered better by TV than by book subjects, probably because the continuous moving imagery of the television cartoon and its use of freeze and close-up camera shots highlighted the spectacular events featuring the fox to a greater extent than the book. This was borne out in responses to the comprehension questions (especially question 2): book subjects were more likely to be misled by ambiguous contextual cues when interpreting story events. Both findings imply that television emphasizes movement and

characters' actions more vividly than books. Meringoff (1980) also found that children who watched a television story recalled more story actions and visual content than children who were read the same story in a picture book.

No serial position effects were found in memory for either the book or the television narrative. This result is not surprising, since narratives are based upon sequences of events which are causally and logically related; Brown and French, (1976) have shown that children as young as 5 years are capable of capitalizing upon these causal relationships when reconstructing the temporal order of sequences of events. Rendell (1981) found that children's memory for events near the beginning of a television program was relatively poor, but this result was attributed to lowered attention during the familiar theme run-in and credits which began the program. In the current study subjects who watched the TV remembered events near the beginning of the story well and remembered them better than subjects who were read the book. This also may be explained by attentional factors which are linked to contextual differences between viewing television and reading a book. Singer (1980) has claimed that the visual attractiveness and dynamism of television maximizes the orienting response, and that its novelty and constantly changing imagery ensure regular patterns of attention to the screen. By contrast, books are not so alluring. Reading a book requires more adequate preparation - the reader has to settle himself/herself into a situation that is relatively free from visual or auditory distraction. Consequently, when the presentation and pacing of information is controlled by an outside person, the reader does not have the same autonomy. In the current study, book subjects frequently looked away from the book, or at the narrator, during the initial stages of the story, indicating that they wanted the page turned. This distraction probably

accounted for their relatively poor memory of events at the beginning of the story.

As expected, performance on the comprehension task was related to both age and verbal ability. The fact that verbal ability was not a significant determinant of performance on the ROTO task indicates that the task is a valid measure of children's memory. Furthermore, it can be used successfully with children as young as 4 years, if they are given initial practice items.

In conclusion, both book and TV subjects showed an adequate level of memory and comprehension of the story. The medium differences which were found appeared to be related to specific structural features such as the pacing of information, the style of presentation, and the type of imagery. These findings are in accord with those of Meringoff (1980) and reinforce the view that structural components of stories interact with content-related factors to affect what is remembered and understood.

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Young Children's Understanding of Emotional States as Depicted by Television Cartoon Characters

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The aim of this study was to investigate 5 to 9 year old children's understanding of emotional states as depicted in a television cartoon, and to relate Selman's stages of conceptions of jealousy to age, cognitive perspective taking ability, and other personal characteristics. Eighty children in two age groups saw a short television cartoon and then completed three tasks individually. First, children judged the emotional states of a single cartoon character from eight colour photographs taken from the cartoon. Second, children answered open-ended questions about a cartoon character's feelings, and about jealousy. In a separate testing session children completed the Peabody Picture Vocabulary Test and the Landry and Lyons-Ruth Scale of Cognitive Perspective Taking. Teachers completed four sub-scales of the Thomas, Chess and Korn Teacher Temperament Questionnaire for each child. Age and verbal intelligence were significantly related to the Selman classification of conceptions of jealousy. Ability to identify emotional states from graphics was related to age, but was not significancly related to cognitive perspective taking ability or temperament ratings. This study provided preliminary data relating to young children's awareness of television characters' emotional states and children's conceptions of jealousy. Methodological problems are discussed.

Graphic cartoons are a medium through which a wide range of emotions can be conveyed, as was recognized by Koffka in the 1930's when he wrote:

> The best examples (for our argument) are perhaps certain trick films after the pattern of Mickey Mouse, for here there is objectively neither motion nor emotion, but a mere sequence of strange drawings. But this sequence gives rise to objects in the behavioral world of the observers which move, and are agile or clumsy, exuberant or dejected, and so forth.
>
> (Koffka, 1950, p.657)

In this study, children's understanding of the emotional states portrayed in a graphic television cartoon was related to their age, social perspective taking ability, verbal ability, and temperament. Eighty children aged from 5 to 9 years completed two measures of emotional awareness: (i) questions based on Selman's (1979) measure of jealousy understanding and (ii) judgements of specific feelings from graphic pictures.

Recently, workers in the child development area (Damon, 1977; Selman, 1980) have suggested that cognitive perspective taking is related to children's understanding of several social domains, including the concept of jealousy. Selman and his co-workers have formulated a series of levels of perspective taking which they argue underlie children's developing social concepts. Based on these levels, they have suggested the developmental course that children's concepts of jealousy follow. They have worked from children's responses to structured dilemma interviews and have devised a complex scoring system used to assign children to the various levels. Their method was developed from that of Kohlberg, but differs in that the dilemmas are carefully chosen to be relevant and meaningful to young children. The three perspective taking levels that apply to the age group we studied are as follows:

Level 0: Egocentric perspective taking (about ages 3 to 6). The child understands that others have thoughts and emotions but does not realize that another may see the same social situation differently than he or she does. Persons are not seen as jealous of other persons but of the things that other persons are doing or playing with.

Level 1: Subjective perspective taking (about ages 5 to 9). The child understands that others' thoughts or feelings can be different from his or hers. This understanding is still limited to a simple one-way conception, e.g., a gift makes a person happy. They feel hurt about being excluded, but are still jealous about objects and actions, not about relationships.

Level 2: Reciprocal perspective taking (about ages 7 to 12). Two-way reciprocity of thoughts and feelings. Children put themselves in others' shoes and realize that they will do the same. They realise that people can deceive others as to their inner states. They feel slighted, or left out of the interpersonal interaction.

Our cartoon presented a jealousy dilemma that was considered to be relevant and meaningful to young children: a boy feels jealous because his dog prefers to play with someone else. It was hypothesized that children's understanding of this theme should follow the same developmental progression as Selman found in responses to his dilemmas. We were also interested to see whether scoring could be simplified and whether scoreable answers would be given by the children to simple, standardized questions about jealousy.

The second focus of this study was on the developing ability of young children to attribute emotional or feeling states correctly to a television character. Early this century, Helen Keller, in a letter to William James, dramatically suggested that learning the verbal symbols for feelings and emotions may play a most important role. She wrote:

> I do not think I truly remember emotions which I experienced before I was taught. I knew I had them because I have a factual memory of shedding tears, screaming, kicking, and other acts which indicate feeling. Yet in no case can I recall the emotions as such. I used to hunt for good things to eat, and when I failed to find them I cried. But, to save my life, I can't remember the disappointment which caused the tears. I am astonished that there should be such distinct images of different acts in my mind side by side with such a vacuum of emotional memory.
>
> (In Lash, 1980, p.363)

Borke (1973) demonstrated that the ability to label the feelings of happiness, sadness, anger, and fear from line drawings of faces develops early, with only sadness and anger still being confused by 6 year olds. This study investigated children's ability to identify more complex feeling states from cartoon graphics.

Method

Subjects

Eighty children were subjects for this study, 40 children in their first school year (mean age = 6.0), and 40 Grade 2 children (mean age =

8.0). They came from two Melbourne Primary Schools within the same geographical locality. Children were randomly selected from a larger group whose parents had given permission for their children to participate in the study. These age groups were selected on the basis of Selman's report that few 5 to 6 year old children should be capable of self-reflective perspective taking while about 50% of 8 year olds should be at this level.

The Cartoon

The cartoon was about 5 minutes long. It had three characters: a boy, his dog and a girl. There was a musical soundtrack, but no words. The story starts with the boy unmelodiously practising a violin. The dog joins in, howling, to the boy's annoyance, and he chases the dog away. The girl begins playing a piano well, and the dog goes to her house and sings with her. It is clear that the dog prefers singing with the girl to playing with the boy. The dilemma is resolved by the boy practising again and improving; finally all three happily perform together.

Procedure

Children saw the television cartoon in pairs, with two adults, and then completed the two measures of emotional awareness. First, children judged the emotional states of one cartoon character from eight colour photographs taken from the cartoon. Second, children answered open-ended questions about the boy's feelings and about jealousy. In a separate testing session children completed the Peabody Picture Vocabulary Test and the Landry and Lyons-Ruth bystander cartoon measure of cognitive perspective taking. Teachers completed four subscales of the Thomas, Chess and Korn Teacher Temperament Questionnaire for each child: the Adaptability, Approach/Withdrawal, Intensity and Mood subscales.

Measures

Understanding of jealousy: Selman's perspective taking measure. Children were asked four questions about the cartoon's jealousy theme: How do you think the boy felt about his dog playing with the girl? Do you think he might have been jealous? What do you think he was jealous of? What does it mean to be jealous? On the basis of answers to these questions, two independent scorers assigned children to one of Selman's levels of cognitive perspective taking, using the extended descriptions given in his 1979 scoring manual. Agreement between the scorers was 80%, and all disagreements were easily resolved by discussion.

Judgements of feelings from pictures. Eight colour photographs of the dog character were taken from the cartoon. The pictures were labelled as representing the following feeling states: happy, cross, scared, surprised, shy, curious, puzzled, "doesn't want to". All but one of 11 adult judges agreed perfectly with our labels and these judgements became the criteria against which children's judgements were evaluated. The photographs were complete frames from the cartoon and included details such as body posture and other situational cues. This procedure was followed because it was felt that artificially restricting the normal range of supporting contextual cues by concentrating on discrete, separate cues would result in a task only peripherally related to understanding of a TV cartoon. Happy and cross were included for two reasons: (a) they would provide some indication of overall task difficulty, and (b) a couple of easy items might prevent discouragement in young subjects. The eight photographs were placed in front of each child in random order and the child was asked, for example, to "point to the photograph where the dog felt happy in the cartoon". This procedure was followed for each of the eight feelings.

Landry and Lyons-Ruth cognitive perspective taking task. This measure uses bystander cartoon stories derived from Chandler and Greenspan (1972) and Urberg and Docherty (1978). It requires subjects to describe the same events from several points of view. A short story supplemented by cartoon pictures is presented and subjects are asked to state characters' feelings, especially late arriving characters who have access to less information than the subject has. These tasks are considered to measure whether subjects can set aside story details known only to themselves and adopt different perspectives from their own. Landry and Lyons-Ruth developed these bystander cartoons to measure two levels of perspective taking which they claimed were parallel to Selman's level 1 and level 2.

Results

Preliminary analysis showed no significant sex differences and consequently boys and girls are grouped together in all subsequent analyses.

Understanding of Cartoon's Jealousy Theme

Table 1 compares the percentage of children scored at each level on the cognitive perspective taking task and on the understanding of jealousy task.

Table 1

Perspective Taking and Jealousy Understanding Levels by Age Group

	Task					
	Landry and Lyons-Ruth Cognitive perspective taking task			Selman: Understanding of jealousy		
	Failed	Passed				
	Levels 1&2	Level 1	Level 2	Level 0	Level 1	Level 2
Age group	%	%	%	%	%	%
6 yr olds	25	28	48	88	10	3
8 yr olds	5	30	65	48	25	28
Total (N=80)	15	29	56	68	14	12

For the cognitive perspective taking task our results were similar to Landry and Lyons-Ruth's (1980) results with expected age differences. Children's performance on the Selman based social perspective taking task was lower than expected and suggested a fairly poor understanding of the cartoon's jealousy theme. The Pearson product moment correlation between the two measures was significant, $r = .31$, $p<.01$. However this relationship was reduced when verbal ability was controlled, $r = .22$, $p<.05$, and disappeared when age was also controlled, $r = .11$, n.s. Thus cognitive perspective taking was not closely related to Selman's perspective taking levels in this study.

Nevertheless, at level 2 the jealousy comprehension task responses were not independent of the cognitive perspective taking task responses. Nine of the 12 children who passed the jealousy comprehension task at level 2 also passed the cognitive perspective taking task at level 2. Landry and Lyons-Ruth's results were similar, and they suggested that for most children level 2 thinking on the bystander cartoon task seemed to be necessary but not sufficient for success on their Selman task. Our results showed some support for this finding.

While the jealousy comprehension level scores suggest a fairly poor understanding of the cartoon's jealousy theme a closer look at what the children actually said in response to the interview questions revealed that a majority of children in each age group correctly answered the first three questions. For example, 77% of 6 year olds and 100% of 8 year olds correctly identified the boy's negative feelings, although a range of specific feelings was given: mad, cross, angry, mean, unkind, sad, frightened and scared. It was the fourth question, "What does it mean to be jealous?", which was not directly related to events in the cartoon, that proved difficult. With young children it may be necessary to use the less structured probe questions advocated by Selman. Certainly children were generally aware that the boy felt bad and, in a simplified way, they were aware of the reason for his feelings. However, overall their answers typically seemed to fit Selman's level 0 jealousy concept.

Judgements of Feelings From Graphic Pictures

Individual feelings. Children judged the feelings of a cartoon character as depicted in eight graphic pictures. Table 2 gives the percentage of children correct for each feeling.

Table 2

Percentage of Correct Judgements for Each Feeling by Age Group

	Individual feelings							
	Happy	Cross	Doesn't want to	Puzzled	Scared	Surprised	Shy	Curious
Age group	%	%	%	%	%	%	%	%
6 yr olds	80	80	50	60	43	25	23	5
8 yr olds	83	75	80	60	50	48	45	30
Total (N=80)	81	78	65	60	46	36	34	18

There were significant age differences on two feelings: "doesn't want to", $\underline{x}^2(1) = 6.64$, $\underline{p}<.01$, and curious, $\underline{x}^2(1) = 7.01$, $\underline{p}<.008$. The 20% error rate for happy and cross indicated the difficulty of this task. Further analysis of the children's errors suggested that the initial results underestimated children's awareness of some feelings. For each of surprised, scared, curious and shy, just one other photograph was picked by a large proportion of children. Their choices indicated an approximate understanding of these feelings, e.g., 25% of children chose the puzzled picture for the feeling curious. These results suggested that the children were developing an awareness of various emotional states and could readily identify at least some of these from graphic depictions of feelings.

Overall ability to judge feelings. The number of photographs judged correctly was totalled for each child to give a measure of overall ability to judge feelings. The mean number of correct judgements was 3.6 for 6 year olds and 4.7 for 8 year olds. This difference was significant $\underline{t}(78) = -2.86$, $\underline{p}<.005$. Contrary to expectations this measure was not significantly related to cognitive perspective taking. It was significantly related to jealousy understanding, Pearson $\underline{r} = .35$, $\underline{p}<.01$, but again this relationship diminished when verbal ability was controlled, $\underline{r} = .26$, $\underline{p}<.01$, and disappeared when both age and verbal ability were controlled $\underline{r} = .08$, n.s.

Teacher Temperament Questionnaire

Few significant relationships were found between the four temperament subscales and other measures. Hypothesized relationships generally did not emerge. There were, though, two significant correlations between children's verbal ability and teacher ratings: teachers regarded verbally competent children as more adaptable, Pearson $\underline{r} = .23$, $\underline{p}<.05$, and less withdrawn, $\underline{r} = .27$, $\underline{p}<.01$.

Discussion

Most children demonstrated some appreciation of the cartoon's jealousy theme. They could correctly identify the boy's negative feelings as being related either to his dog playing with someone else, or to the girl being a better musician than he was. Most 6 year olds' concepts of jealousy appeared to be at Selman's level 0: they located the source or cause of jealousy in activities or objects rather than in the people themselves. Selman's description of children at this level as "jealous in the sense that they simply want something that someone else has or to do something he/she is doing" seemed to apply particularly to our younger subjects. Just over half of the 8 year olds gave higher level responses and appeared to have some awareness of jealousy as the psychological state of being "left out", being snubbed by a friend. There was some evidence that cognitive perspective taking was a necessary but not sufficient condition for this more advanced understanding of the interpersonal relationships depicted graphically in the cartoon. The cartoon was nonverbal but, not unexpectedly, verbal ability had a low but significant correlation with scores on the jealousy questions. Results suggested that differences in cognitive perspective taking ability and verbal ability together accounted for a small but significant amount of variance in children's understanding of the cartoon's jealousy theme.

Children's ability to judge correctly graphic representations of eight different feeling states varied across age and particular feeling but was not related to children's understanding of jealousy. The nonrandom distribution of errors on this task suggested that while children, particularly in the younger group, had difficulty in labelling some pictures precisely, they often had an approximate understanding of the feeling involved. Given the task difficulty, there appeared to be a fairly high level of understanding of the graphic conventions used in the cartoon

to represent feeling states. It is important to remember that the cartoon provided no verbal cues as to the character's feelings. The children appeared to be sophisticated interpreters of the symbolic language embodied in the cartoon graphics and were aware of a variety of emotions and feelings displayed by the characters. While 5 to 8 year old children rarely use words describing covert psychological states when they are describing other people (Livesley & Bromley, 1973) they are nevertheless aware of diverse feeling states.

Children's temperament, as measured by the teacher rating questionnaire used in this study, was not related to understanding of the cartoon's emotional content. This may be a function of the method of measurement rather than evidence that there is no relationship between temperament and identification of emotions.

Finally, the absence of sex differences is of note. Teachers and others often speculate that girls may have more social awareness and sensitivity to others' feelings than boys of the same age. This study produced no evidence to support this idea with girls and boys performing equally on all tasks.

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Children's Interactions with Television: New Research Perspectives and an Eye on Future Developments

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The aim of this paper is to put the research reported in the preceding papers into a broader context, and in so doing to find an explicit role for the experimental techniques used. The studies provide a good illustration of the kinds of developments that have been taking place in recent years, in research on the impact of television. Such developments are a reflection of more general trends in experimental psychology over the past two decades. These trends revolve around the movement of experimentalists away from the behaviourist tradition, which emphasised the magnitude of individuals' overt reactions to social stimuli, towards a cognitive, information-processing framework which stresses the interpretations individuals place on their direct and vicarious experiences.

The paper is divided into three parts. The first part examines the movement in mass media research towards a cognitive-analytical framework, particularly with respect to the scientific investigation of the interaction of viewers - young and old - with television.

The second part is concerned with possible future extensions and developments in research on television generally, and in particular with regard to the experiments reported in the previous three papers.

The final section of this paper outlines some possible methods for teaching children and adults to understand the medium of television and to use it actively and constructively, as a means of enhancing children's intellectual development.

A Shift in Perspective in Research on Television

The last two decades have witnessed a major shift in psychological theory and research, away from the reductionism of stimulus-response theories of learning or drive-reduction models of personality, towards a cognitive orientation that focuses on human information-processing capacities, and the ways in which individuals select, interpret, organise, and retain stimuli impinging on them from the environment (see Singer, 1980; Tannenbaum, 1980). This new perspective embodies a conception of the individual as playing an active and selective role in how he or she approaches and interacts with the environment. There is an emphasis also on the fact that individuals bring with them to each new situation pre-established expectancies and plans (i.e. schema) which are based on previous experience. These schema have been built up usually over many prior interactions with the environment, or on the basis of other kinds of less direct learning experiences.

The various schema or modes of interpreting and organising events encountered in the environment are also in part dependent on the developmental stage individuals have reached. Children in general have been exposed to fewer experiences or to far less information than adults, and lack certain kinds of organising and interpretive skills. Young children, in particular, take longer to grasp certain kinds of concepts, and are unable to make sense of some ideas or experiences before they have reached a certain age or level of cognitive development. This is true of children's interactions with television as well as with events experienced in real life. Mass communications researchers have come to recognise the importance

of assessing the internal, cognitive processes underlying young viewers' appraisals and comprehension of television programs and how these processes develop throughout childhood.

Early research on television and children focused on the effects of the medium on youngsters' social behaviours. Most studies were carried out within the conceptual and methodological frameworks of prominent learning theories of the day and their findings were interpreted to show that television could exert a direct impact on the behaviour patterns of children and adolescents who reacted almost passively or automatically to the portrayals to which they were exposed (Bandura, 1969; Bandura, Ross, & Ross, 1961, 1963). Very little effort was invested in researching the extent to which children differentiated between programs or portrayals, whether or not they followed storylines and interpreted the actions of characters in the context of the story, whether any of these cognitive, information-processing factors mediated children's behavioural reactions to programs, or what form such reactions might take.

Of late, researchers have turned their attention to the analysis of how viewers process information from television programs (e.g., Collins, 1970, 1975; Singer, 1980). This orientation not only marks a significant departure from traditional "effects" research which focused on observers' overt behavioural reactions to television or film content, it has also led to a revised conception of the viewer as an active rather than a passive participant in viewing.

The shortcoming of the "behavioural effects" perspective was that it oversimplified the viewing experience, largely for convenience of measurement. Researchers working within this framework typically assessed relatively crude, although readily quantifiable responses to a narrow and unrepresentative range of television and film materials.

Studies have often consisted of series of experiments, with small variations along a basic theme or design, in which the same one or two film clips are used throughout.

The reality of television viewing is that people watch many different kinds of programs and exhibit many different kinds of reactions to them. Viewers' responses to programs depend on the nature of the content and the way that the content is encoded and interpreted. Information encoding and processing from television can be highly complex. Viewers often assimilate the content of television programs in a sophisticated, multidimensional fashion, using many different attributes which characterise the program they are watching. This contention has been supported convincingly by evidence from two research projects on which I have been working.

The first project examined the effects of content and production format of television news bulletins on audience retention of the information presented. In one series of experiments it was found that if viewers were presented with a sequence of three or four news items about a single topic, such as politics, industrial disputes, or sport, memory performance declined across the similar items. Apparently, the content of one item interfered with encoding and/or retrieval of the content of subsequent semantically related items. Memory performance improved when the sequence contained news items from semantically different categories. These effects occurred for several different news topics and topic-shifts, indicating their generalizability across news topics. In other words, the effects were genuine replicable memory phenomena (Gunter, Berry, & Clifford, 1981; Gunter, Clifford, & Berry, 1980). As well as showing something about the effects of news packaging on audience retention of program content, the results also indicated that gross taxonomic

attributes of news stories were being encoded by viewers along with specific story details. Another study (Gunter, 1979) indicated that under spontaneous recall conditions, items accompanied by visual content, such as film footage or stills, were better remembered than items presented by a "talking-head" (i.e., the newsreader). This result suggested that visual elements of news stories were encoded along with verbal narrative. There was also some indication of a visual enhancement effect on memory in the item-shift paradigm in which taxonomy of news is held constant over several items, and shifts are made from one type of visual format to another (Gunter et al., 1980). More recent research in this area has suggested that even sex of newsreader may be encoded as an attribute of news stories (Berry, Clifford, & Carter, 1982).

In the second project, audience perceptions of television violence were examined in an attempt to develop a framework in which violent portrayals in television drama programs could be systematically classified in terms of their perceived seriousness (Gunter, in press; Gunter & Furnham, in press). Results showed that adolescent and adult viewers made highly refined judgments about violent television portrayals based on a number of attributes. The attributes included: (a) fictional context (e.g., contemporary crime-detective, historical western, futuristic science fiction, or animated cartoon); (b) geographical location (e.g., Britain or America); (c) physical-environmental setting (e.g., indoor or outdoor, daytime or nighttime); (d) character types involved in violence (e.g., law enforcers or criminals, males or females); (e) physical form of violence (e.g., shootings, fights, stabbings, explosions); and (f) degree of harm caused by violence (e.g., fatal or non-fatal injury or no injury).

Under experimental conditions in which viewers were not specifically instructed to distinguish between portrayals in terms of these attributes, and were not aware that these attributes were being manipulated, consistent and often highly significant differences emerged in the way violent portrayals were perceptually evaluated. Viewers in general consistently rated some types of portrayals as more serious than others. There were also interactions between type of portrayal and personality of viewer: certain personality types regarded certain portrayals as particularly violent compared with the perceptions of other viewers (Gunter, in press).

The implication of these findings is that mature or experienced viewers of television make complex judgments about violent content. Violent portrayals are encoded and decoded in terms of many characteristics, and the way in which any portrayal is processed and interpreted is likely to predetermine other, perhaps more overt, reactions to it on the part of the viewer. Of course, younger and less experienced viewers cannot be expected to make such complex appraisals of programs, but it is important to find out the extent to which these kinds of judgments are made at different ages, and whether or not it is possible to teach children to make more complex judgments about television violence at an early age.

Most of the recent evidence bearing on children's comprehension of television has indicated that very young viewers process little of the complex information presented to them in certain types of programs. In evaluating a number of action-adventure and drama programs, Collins and his co-workers in the United States found that children up to second grade recalled just over 50% of scenes depicting central content and even fewer scenes depicting implicit content (Collins, 1970; Collins, Wellman, Keniston, & Westby, 1978).

Their research has indicated that preschoolers and early school-age children do not infer relationships between scenes and do not interpret the social and causal contexts of certain portrayals (particularly violent portrayals). Collins has argued that young children may have an incomplete or distorted comprehension of television portrayals because they do not link actions with motives or outcomes (Collins, 1973, 1979).

Directions for Future Research

Comprehension of Television Programs

The research reported earlier in this monograph offers support for the American findings among Australian children. In the Australian studies, whilst very young children were capable of identifying isolated scenes from a program they had watched a short time before, they were less able to remember correctly the order in which the scenes had occurred. Differences between recognition and reconstruction of temporal order (ROTO) scores indicated that young children lack the cognitive strategies which enable older children and adults to organise their store of memories of television programs and to reconstitute the original order of events in the story. As a followup to these studies it would be interesting to use the ROTO task to investigate young viewers' awareness of the relationships between events in programs. The ROTO task has so far shown that children are able, during early school years, to reconstruct the temporal order in which scenes in a program occurred. The task requires children to make simple judgments - indicating which of two visual events came first. The task could be adapted to assess the extent to which young children understand and are able to reproduce the connections between events in a televised story.

Are very young children of early school age able to identify the relationships between scenes in which actions are planned and scenes in which the actions are carried out? A further experiment in which this could be tested, using the ROTO task, might compare youngsters' abilities to reconstruct the correct temporal order of scenes between which motivational relationships exist and scenes between which there are no such connecting threads. Children who use their knowledge of these relationships within the story to guide their judgments should perform better on scenes between which there are close motivational connections, irrespective of their temporal proximity in the program, than on scenes between which there are no such relationships. The ROTO task is sufficiently subtle to reveal a great deal about the extent to which children at different stages of cognitive development learn to make complex judgments about the causal and motivational relationships between events in televised stories.

Any further experimentation should also take into account personality differences among children which may be related to their interpretations of television content, and especially of violent content. Research with adults has already shown that interpretations of violent portrayals are strongly related to a number of distinct personality factors such as personal disposition towards aggressiveness, introversion-extraversion, neuroticism and psychoticism (Gunter, in press; Gunter & Furnham, in press). There is evidence that children are strongly attracted by rapid movement and exciting arousing action sequences on television; these features are often associated with violent drama programs (Watt & Krull, 1977). Young viewers, particularly those who are already predisposed to be aggressive or violent, and who have less well developed internalised codes of self-control, are often unable to see the connections between

action, motive and outcome because of the salience to them of the action alone (Tannenbaum, 1980; Zillmann, 1975). Making these connections is crucial to the ability to judge the rightness or wrongness of an action. In turn, inability to make such moral judgments may facilitate the impact of violent portrayals on young viewers' social, or more accurately antisocial, behaviours. Early researchers working within the behaviourist tradition also demonstrated this kind of effect of watching televised violence, but the cognitively oriented research approach has added to our overall understanding of the way these effects operate and how they might be alleviated, by revealing the significance of viewers' interpretations of what they see on television to the way they eventually react. Making a meaningful connection between a violent action and the reasons for its occurrence, or its consequences for the perpetrators or the victims, may have important moderating effects on the likelihood of a viewer reacting to the portrayal in an undesirable manner.

In summary, additional research of the kind reported in the preceding papers is needed to provide a more detailed analysis and a better understanding of children's developing comprehension of television programs. The experiments reported are important as much for the techniques they have introduced and tested as for their original research findings. Future research should be involved not simply with the assessment of children's developing comprehension of television with age, but also, more importantly perhaps, with whether youngsters' regular interaction with television exercises certain not always desirable effects on their general cognitive and intellectual development.

Television and Cognitive Skills

Television undoubtedly has a considerable impact on children. Given the amount of time youngsters spend watching television every day, if it does nothing else it manages with consummate ease to draw them back to it day after day. The supposedly harmful effects of television on childrens' social behaviour have, over the years, come under close public scrutiny and criticism. It is my belief that such effects usually occur at a very low level, if at all. A more important issue which merits close consideration and investigation is the influence of television on cognitive and intellectual performance. The issue is not simply how well children of different ages understand television programs, although this is important, but the extent to which television viewing exercises only a narrow range of cognitive skills.

Singer (1980) has recently stated that "as entertainment television works by appealing to the lowest common denominator of cognitive-affective systems" (p.61). Its continuous, rapid-fire presentation of material allows little or no time for extended reflection or retention of content, or for careful critical evaluation of information. Inherent in the very power of the television medium, an important component of which is its visual attractiveness, are its limitations. With its clever use of constantly changing, short audio-visual sequences, television holds our attention by a sensory bombardment that maximizes orienting responses towards it, and thus persistently draws us back to the screen to process each new sequence of information that it presents.

Television viewing does not provide a psychological situation that permits us to process the information presented in a manner that will allow the most efficient later use of what we have seen. In

adapting our cognitive strategies to cope best with the kind of stimulation television provides there is evidence to suggest that certain cognitive skills are exercised more frequently than others; when this occurs amongst young children at critical stages of cognitive development there may be serious repercussions which manifest themselves in youngsters' subsequent educational achievement and social behaviour.

Make-believe and imaginative play have been emphasied by some writers as very important aspects of the growth experience of children and ones which are closely tied to the development of cognitive, emotional, and interpersonal skills. Quite a number of studies have shown that training children in make-believe and imaginative fantasizing can increase their capacity to tolerate delays, to move more smoothly into school, to empathise with other children's feelings, to increase the level of their verbal fluency, and to become more effective in social interactions (Singer, 1973; Singer & Singer, 1976).

Imitation of fantasy material on television could play an important role, but unfortunately the television set normally holds the child fixed to it, and thus does little to encourage the young viewer to engage in quiet periods of practising make-believe; these are essential for complete development of this cognitive process. Television, by presenting novel material with such rapidity, works against imaginative replay. Instead, by incessantly bombarding the senses with new information, television causes cognitive overload, which may in turn force the viewer to "tune out" selectively much of the content. Also, in many cases, television's vivid imagery precludes the need for the young viewer to elaborate further in his or her own imagination.

Media Literacy

One important research development for the future might be to teach children how to use television to enhance rather than to inhibit their cognitive growth during their early years. Parents need to be encouraged to participate actively in their children's viewing by talking to their youngsters about programs, by cultivating selectivity in viewing, and by encouraging make-believe play. Television programs could be used as the initial stimulus for fantasy activity.

Children must be encouraged to think about television while they are watching; television can in turn be used to motivate youngsters to engage in other thinking or imaginative pursuits which involve different kinds of cognitive effort from those principally elicited during television watching.

The aims of this kind of research should be to develop practically oriented projects which encourage active, thoughtful and critical viewing amongst children, and to study the impact of such viewing in natural viewing environments such as the home. Recently, naturalistic experiments on leisure pursuits and time allocation to different social activities have been carried out in the United States: individuals carried electronic beepers of the type used by doctors, which would go off randomly and required the carrier to report at once what they were doing (Pope & Singer, 1978). Such a device could be employed to monitor daily television viewing: parents could be trained to record their childrens' viewing patterns, or viewers could record their own reactions to the program they are watching when the beeper sounds. The beeper could also be used as a signal for the onset of parent-child discussions about particular programs. Such discussions could be spontaneous or, perhaps more desirably, could follow a certain theme or structure predetermined by

the researcher, and specifically prepared for the type of program the family are watching at the time. Laboratory-type tests such as those reported earlier in this monograph could be used to monitor objectively the progress of children's comprehension of television programs, by including materials from television series which have been the subject of parent-child discussion.

Schools too, could be encouraged to incorporate into the curriculum courses on television literacy, designed to teach children about production techniques and the appraisal of dramas and documentaries from various perspectives, e.g., program content, production style, and aesthetic quality. Such courses could either be introduced as new and independent subject matter, or could be run as part of current courses such as English Language or English Literature. Objective experimental testing of the success of these courses could be carried out at regular intervals.

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